GAS JOURNAL, OCT. 9, 1940

VOL. 232 92nd YEAR No. 4038

EDITORIAL NOTES

TO-DAY AND TO-MORROW

NEITHER "abnormal" nor any of its "stable companions" would seem to supply the right word by which adequately to describe the position of affairs to-day. Perhaps "abnormal, only more so," is as near as one can get in the way of a "pen picture," with the aid of a vocabulary whose strength is sadly unequal to the occasion. Should a situation at all comparable arise again in the future, it may find us provided with terms more suited to deal with it. Certain it is that, not within living memory have people been so circumscribed, both in action and in word, as is the case at the present moment. But at the same time there remains scope for sound individual judgment, despite the fact that rules and regulations have issued forth—as, no doubt, they must issue forth at such a time—in almost bewildering confusion. It is, as we see things, matter for congratulation that individual responsibility should occupy a recognized position in so far as may be practicable, even in a period of stress such as that through which our country is now passing.

For this reason we have been particularly gratified to find this position so convincingly stressed at the meeting of the Wales and Monmouthshire Association of Gas Engineers and Managers, which will be found reported on later pages of this issue. It was in connexion with a conversational, and in parts confidential, discussion on wartime problems in the Gas Industry that Mr. R. G. Shadbolt strongly voiced the opinion that, whether a case happened to be normal or abnormal, "the initiative lay with the Technical Chiefs to formulate the policy to be pursued, and the sooner they did so the better, if the utility and reputation of the Industry were to be properly conserved." He was referring to the policy to be adopted in the matter of wartime repairs, renewals, and maintenance, and he had taken as his text the following sentence from a Paper read at the last May meeting of the Association : "Owing to the scarcity of materials and labour due to urgent Government and military requirements, renewals had perforce to be postponed and neglected, and at the end of the war most undertakings were faced with a list of deferred renewals and urgent extension requirements that were appalling." Yes—there is the experience of a Four Year war to draw upon ; and the lesson which Mr. Madden drew from it in his Paper is plain for all to understand.

And this is a matter which, as Mr. Shadbolt pointed out, refers first and foremost to the responsible Technical Chiefs ; it is for them to determine upon the policy to be pursued, and upon their views and recommendations will depend the future, as well as the present, utility of the undertaking. The best possible should be done to keep pace with necessary repairs, renewals, and maintenance of all plant and apparatus. The Technical Chief may not be able always to "carry" his views and policies ; but, Mr. Shadbolt said, "it is up to him to make these views and policies known to, and understood by, his Board or Committee, or he may find himself, as has happened in the past, saddled with the blame for whatever untoward developments may occur." Not a cheery possibility! But one, fortunately, which need not be faced if prompt action be taken—judging from the statement of Mr. W. Morland Fox speaking from the Contractors' angle), that members should not be apprehensive and defer their repairs and renewals, but should "remember the example of the last war, when the available resources of all contractors were unable to meet the essential requirements of the Industry in the succeeding years of reconstruction."

A further matter of importance discussed and settled upon by the Wales Association at the Cardiff meeting was the formation of a Gas Coke Association, and we are very glad indeed that the settlement arrived at was that an Association covering the area should be established. The principle, said Mr. Madden, should be 100% united action ; we hope this principle will be translated, without delay and without argument, into actual fact. Yesterday, in a Paper presented to the Institute of Fuel, Mr. W. L. Boon, of the London and Counties Coke Association, set out some thoughts on coke which he would like to feel could be resolved into the following conclusions : That the coke industry as a whole has a policy of progressive development and that quality of coke and its efficient utilization are major planks in that policy ; that the effect of the co-operation and co-ordination taking place within the industry is not only to its own advantage but to the benefit of the trades and industries with which it has allied interests ; that its service is beneficial to the consumer of fuel, and that its policy is in line with a proper conservation of our national fuel resources ; that the function of the technician is really essential to the future progress of the solid fuel industry, and that that function is largely unseparable from its commercial structure ; that market development and research must become a part of its normal activity and be interpreted in its widest sense to the common good ; and that the evolution of voluntary associations in the coke industry provides a practical combination to the common good, to the progress of the industry, and to its future prosperity. The Gas Coke Association covering Wales will be a welcome addition to the other Coke Associations, which have proved their worth, in various parts of the country.

GAS FOR MOTOR TRANSPORT

WE publish to-day the first part of a Paper prepared by Dr. E. A. C. Chamberlain, of the Gas Light and Coke Company, on the important subject of the conversion of petrol vehicles to town gas. The Author discusses the use of gas at ordinary mains pressure and deals with the theoretical and practical problems which have arisen and the developments which have taken place during the past year. A primary consideration of conversion is that the cost of alterations shall be as low as possible and that the performance of the engine on petrol shall not be adversely affected by the alterations made. Developments during the past year, however, have shown that simple conversion can be most successful and that the limitations imposed do not seriously affect the value of gas as an alternative fuel; and there is no doubt that the low-pressure gas system is capable of making a valuable contribution to the national economy of petrol. Engine performance on town gas is dealt with in detail in the Paper and the influence of the gas container and auxiliary equipment is indicated. Besides these factors, there are the many details in design which give rise to the individuality of the makes of vehicle on the roads to-day, and these considerations necessitate individual treatment for each conversion. From experience on several types of private and commercial vehicles ranging from a two-cylinder two-stroke delivery van to an American six-cylinder 20 h.p. saloon car, the Author asserts that, provided a vehicle is in a reasonably good mechanical condition, satisfactory results after conversion from petrol to gas can be achieved. Marked peculiarities in design do, of course, call for special attention when carrying out a conversion, and Dr. Chamberlain's Paper provides a valuable guide to the factors which must be considered.

Improvements are continually being made to equipment, and even better results than those put forward in the Paper may be expected. The figures quoted do, however, show that the low-pressure gas system can be applied to almost any petrol vehicle with every chance of success. The limited mileage does not permit of touring, but for town work the operating radius is adequate, especially as the number of gas filling stations is rapidly increasing. By last July over 80 filling points had been installed in London; and for delivery work such as required by laundries and bakeries the system not only

solves the problem of limited petrol supplies but can actually show an appreciable saving in running costs. Dr. Chamberlain gives an analysis as an illustration of the average performance before and after conversion of a fleet of light delivery vans and sets out the results of the conversion of 70 vehicles of various types. Assuming 300 cu.ft. of gas is equivalent to one gallon of petrol, the saving in petrol in six months has amounted to 7,000 gallons. Over a year, these vehicles will account for a gas consumption of about 8,500,000 cu.ft.

Personal

Mr. C. F. WINDROW has been appointed Secretary to John Wright & Co., Ltd., of Birmingham (one of the constituent firms of Radiation, Ltd.), in succession to the late Mr. D. A. Chapes.

* * *

The Spalding Urban District Council have appointed Mr. RAYMOND B. GARSIDE, of Keighley, as Assistant Gas and Water Engineer. He will take up his duties on Nov. 1.

* * *

Mr. R. H. DUXBURY, Engineer, Manager, and Secretary of the South Bank and Normanby Gas Light and Coke Company, has been appointed by the Directors to a seat on the Board in place of Mr. J. H. Armory, recently deceased.

* * *

We regret the slip which occurred in our Personal column last week regarding Alderman W. BURROWS, J.P. His appointment was to the Chairmanship of the St. Helens Corporation Gas Committee —not Warrington as stated.

* * *

Mr. N. W. WILLINS has been appointed Chairman of the Ayton Gas Company, in the place of Mr. J. Turner, who has resigned owing to ill-health. Mr. Turner had been Chairman of the Company since its inception many years ago.

* * *

Mr. J. K. LAW has retired from the position of Gas Engineer and Manager to the Marple U.D.C., an office which he has filled for nearly 34 years. He has also been Manager of the electricity department since its inception in 1930. He commenced his career as Assistant Gas Engineer at Sowerby Bridge, where there were two gas-works controlled by the Department. The staff at Marple have presented him with a mahogany clock and barometer to mark his retirement.

Obituary

Mr. R. T. SURTEES, formerly Gas Engineer to the Newton-le-Willows Urban Council, has died at Hexham, Northumberland. Mr. Surtees became Gas Engineer at Newton in the early part of this century, and retired 31 years later. He was responsible for the development of the town's gas undertaking, and was credited with having made notable improvements in the undertaking.

* * *

The death occurred on Oct. 1 of Mr. W. H. C. FINDON, a Technical Assistant to Mr. C. T. Price, Engineer and General Manager of the Hampton Court Gas Company. He was in charge of a body of men engaged on the repair of one of the Company's trunk mains, and was responsible for seeing that the gas was successfully bagged off prior to repairs taking place. He returned home during the morning and retired to rest. While he was asleep in the afternoon he was heard to breathe peculiarly, and by the time the doctor could be summoned, he had passed away. Mr. Findon was only 24 years of age, and had been married less than a year. A promising and keen young man in his profession, Mr. Findon had applied for service in the R.A.F., but he was reserved for the Gas Company as he was on vital war work. He was a student of The Institution of Gas Engineers, and had many examination successes. He was appointed Works Chemist to the Hampton Court Gas Company in 1936, and had been in their employ since then.

City and Guilds of London Institute

S.B.G.I. Awards

The Council of the Society of British Gas Industries has again this year awarded prizes in connexion with the examinations in Gas Supply Practice and Gas Fitting of the City and Guilds of London Institute.

The list of awards is given below:

Minor Course in Gas Supply Practice

First Prize of £5 5s.: Ronald H. Hanford, a student of Cardiff Technical College.

Second Prize of £2 2s.: Victor Chesney-Miles, a student of East Ham Technical College.

Final Examination in Gas Fitting

First Prize of £5 5s.: Owen J. Easy, a student of Cambridgeshire Technical School.

Second Prize of £2 2s.: Peter J. S. Crawford, a student of Cambridgeshire Technical School.

Letter to the Editor

Transfer of Labour and Appliances

SIR,—The object of this letter is to call attention to means whereby undertakings in the reception areas could possibly be of some assistance to those in the evacuation areas, and *vice versa.*

In the reception areas there is a shortage of men skilled in gas-works operations, and also of good labourers accustomed to handling coal, coke, and the emptying of purifiers. Skilled stokers for small works are also much in demand. The shortage in these directions, is due in many cases to the demand made for the services of workmen generally by contractors working for the Government.

Should any gas manager whose output is much reduced, and who has therefore to dispense with good workmen, care to communicate with me, it would doubtless be quite easy to arrange for the transfer of such labour to gas companies in reception areas for the duration of the war. It could then be arranged for such men to return to their former employer after the war.

There is one other matter where the two classes of gas undertakings might be of service to each other, and that is in the matter of gas appliances. In evacuation areas large numbers of appliances on hire purchase or hire are now not being used, and if not cared for may deteriorate. In any case they are likely to become out-of-date if the war should last any length of time. In the reception areas there is a shortage of gas appliances, and this is likely to become acute before long. Accordingly, I would suggest that managers with this problem to deal with might care to communicate with me and arrange for the transfer of such appliances.

I would undertake to circulate all such offers to the Managers of the Companies in the Severn Valley and Gas Consolidation group.

Yours, &c.,
G. M. GILL.

Severn Valley Gas Corporation, Ltd.,
Gas-Works, Cheltenham.
Oct. 1, 1940.

Manchester District Association

Forthcoming General Meeting

An Ordinary General Meeting of the Manchester District Association of Gas Engineers is to be held on Friday, Oct. 18, at the Midland Hotel, Manchester, prior to which luncheon will be served at 12.30 p.m. At the luncheon Certificates will be presented to successful candidates in the Institution of Gas Engineers Examinations.

The meeting begins at 1.45 p.m., at which a Paper will be given by Mr. R. L. Greaves, Engineer and General Manager of the St. Helens Corporation Gas Department, entitled "Town Gas in the Manufacture and Heat Treatment of Glass."

Manchester and District Juniors

Annual General Meeting

The 42nd Annual General Meeting of the Manchester and District Junior Gas Association was held at the Engineers' Club, Albert Square, Manchester, on Saturday, Sept. 28, and both the luncheon and the meeting were particularly well attended.

The President reviewed the activities of the Association during the past session. He stated that there were 331 members, a reduction of seven members, as compared with the corresponding period last year. He congratulated Mr. Cartledge on the distinction he had gained by being awarded the Bronze Medal of The Institution of Gas Engineers, and also Mr. Bates on the award of the Silver Medal of the Society of British Gas Industries. Mr. Melling has resigned from the Council, and in his place Mr. F. Cartledge (Oldham) has been co-opted.

The death of Mr. T. Duxbury was referred to by the President, who pointed out that his death had removed from the list of honorary members the name of one who was a very early and ardent supporter of the Junior Associations.

It was unanimously resolved by the members that Mr. Platt be invited to continue in the office of President, along with the other officers.

The question of reducing the subscription was also discussed, but it was decided not to make any alteration, but to carry on with the activities of the Association so far as this can be arranged.

At the conclusion of the business, a very helpful discussion took place on "Air Raid Precautions in the Light of Recent Experiences." The subjects discussed covered the expeditious repairs to gas-works' plant, mains and services; and also the camouflaging of holders.

The next meeting will be held on Saturday, Oct. 26.

The Institution of Heating and Ventilating Engineers announce their removal to temporary premises at 21, Tothill Street, Westminster, S.W.1. (Telephone : WHItehall 9609.)

Modified Street Lighting is to be provided in Leeds, and the Corporation Gas Department has been authorized to carry out the work in certain areas, immediate attention being given to the main thoroughfares.

In Pursuance of the Rochdale Gas (Charges) Order, 1922, Article 5, the Town Council of the County Borough of Rochdale give notice of their intention to reduce the calorific value of gas sold in their area of supply from the present declared value of 475 to 460 B.Th.U. per cu.ft.

Application is to be Made by the Southport Gas Department to the Ministry of Health for sanction to borrow £5,000 for the installation of a benzole recovery plant. The calorific value of the gas supplied by the undertaking will be reduced as from April 1, 1941, from 470 to 450 B.Th.U. per cu.ft., and a revised scale of charges will be introduced at the same time.

At a Special Meeting of the Southport Gas Committee it was resolved that the tender of Messrs. Peckett & Sons, Ltd., for a steam locomotive for the haulage of fuel to the gas-works, be accepted ; and that application be made to the Ministry of Health for sanction to borrow the sum of £1,885 for the purpose. The proposal will be submitted for approval at the meeting of the Town Council.

Notice is Given that the Scunthorpe Corporation Gas Department intend to apply to the Board of Trade for an Order empowering them to obtain a supply of coke oven gas in bulk from the Appleby-Frodingham Steel Co., Ltd., the source of such supply being within the authorized limits of supply of the Corporation. The area of supply will be the Borough of Scunthorpe, and no new works will be required other than the mains that are necessary to convey the coke oven gas to the existing gas-works in Dawes Lane, Scunthorpe.

Savings Stamps for Meter Rebate

Novel Newcastle Scheme

In addition to the sale of Savings Certificates to the Public at their various showrooms and having a Group Savings Scheme for their staff, the Newcastle-upon-Tyne and Gateshead Gas Company put forward a further helpful gesture, which was readily accepted by the Committee, to augment Tyneside's War Weapons Week.

When their meter collectors were emptying the coin meters, they carried with them supplies of Savings Stamps and offered these to consumers in lieu of the usual rebate for gas usage. The public readily responded, and a considerable sum for War Savings was added to the Campaign by this effort.

Richmonds—50 years of Progress

Founded in 1890, Richmonds Gas Stove Company, Ltd. (Radiation, Ltd.), attained its 50th birthday on Sept. 26.

The history of the Richmond Company commenced in a little factory at Warrington with about ten employees. Small as were its beginnings, its policy was conceived on sound lines, under the guidance of its founder, the late Mr. E. W. T. Richmond, and in after years under the late Mr. H. M. Thornton. Expansion was rapid, a comparatively brief period sufficing to bring the business into the front line of manufacturers of domestic gas appliances, and Richmond's cookers soon became a household name throughout the whole country. It is safe to say that there are still in daily use many thousands of Richmonds' "Bungalow" cookers and "Period" gas fires purchased prior to and during the last Great War. All through those troubled years of 1914-18 the Richmond organization contributed in no small measure to the valuable help the Gas Industry rendered the country in the prosecution of the war. In the summer of 1919 Richmonds merged their business in the Radiation Group which was formed at that time. This wise step, bringing together as it did the resources and experience of six large organizations, gave further impetus to the progress of the Company, and it can undoubtedly congratulate itself upon its record of convincing and sound progress in the half-century of its existence.

Had it not been for the task on hand of winning the war, this 50th anniversary might well have marked the occasion for the issue of some more comprehensive step-by-step review of the progress achieved since 1890, but it is well known, and generously acknowledged, that the Richmond Company has made a full contribution to the very high standard of service the Gas Industry has rendered to the public in the past fifty years.

To-day, as part of Radiation, Ltd., Richmonds, working again under war conditions, maintains that same spirit of enterprise and confidence with which it first started, and with which it will emerge when the task at present on hand is accomplished. To the many firm friends Richmonds have made in fifty years they extend their warmest thanks and best wishes for the future, and look forward with assurance to the time when distracting thoughts and unfamiliar tasks can be laid aside, and when peace and reconstruction open the door once more to a further fifty years of service and progress

Food Campaign at Leamington

Brief reference was made in last week's "JOURNAL" to the part played by the Leamington Priors Gas Company in National Food Campaign. The accompanying photograph shows the general arrangement of the stage, with the gas and electricity undertakings' demonstrators explaining points of detail to two school children. Attendances throughout the week averaged 350 at each lecture.

On each afternoon a different team of three school children stood on the low platform to the left of the photograph marked "Food Campaign" and explained the use of the body-building, protecting, and warming foods, and which foods belong to each group. In

front of the stage itself was "a balanced meal" prepared by the school children, a display of vegetables and bottled fruits lent by the Warwickshire County Council Education Committee Horticultural Section, a table with large cards setting out in more detail the various classes of foods, and on this table the work of each day's demonstration was displayed with coloured flags indicating the class of food provided.

The Ministry of Food's posters were displayed round the Assembly Room, and at the entrance was a stall where the Ministry of Food's publications were displayed and could be obtained. At the back of the stage was a back cloth, kindly lent by Radiation, Ltd., representing a furnished kitchen.

The Ministry of Information loud speaker van toured the town, from which an official of the Ministry of Information delivered appeals dealing with the lectures and the Food Campaign generally.

Red Cross Aids Air-Raid Victims

Penny-a-Week Fund

During the last few weeks air raids in the London area and elsewhere have made considerable demands upon Red Cross resources in money, material, and personnel.

Many thousands of blankets and pillows have been supplied for the use of the homeless. Houses have been taken over, equipped and staffed as temporary homes. Clothing of all kinds has been supplied in great quantities. Well equipped sick bays have been opened. Transport has been placed at the disposal of harassed civic authorities. Grants of money have been made to meet the immediate personal needs of those who have lost their all.

The sum of £250,000 recently allocated by the Red Cross to the relief of distress due to air raids is dwindling rapidly, and the need for still greater efforts on behalf of Red Cross funds is very urgent. The 3½ million contributors to the Red Cross Penny-a-Week Fund are helping to the tune of nearly £15,000 a week. This is good, but not good enough. The Fund aims to enrol at least another million regular contributors before the end of the year. Employers and executives can help by bringing the Fund to the notice of their employees, and by providing the necessary facilities for the deduction of the weekly penny from their workers' pay packets.

If your workpeople are not already contributing, send for details of the scheme to the Red Cross Penny-a-Week Fund, 89, Kingsway, London, W.C. 2.

Forthcoming Engagements

Oct.

15.—I.G.E.—Gas Education Executive Committee, 2 p.m.

18.—Manchester District Association.—Meeting. Paper by R. L. Greaves.

26.—Manchester and District Junior Association.—Meeting.

There will be no meeting of the Central Executive Board of the National Gas Council during October.

WALES ASSOCIATION HOLD WORTH-WHILE MEETING AT CARDIFF

These are times in which responsible officials of gas undertakings find small opportunity for leaving their works; yet conditions are such that occasional meetings with their colleagues are likely to prove more than usually valuable. Unusual situations are presenting themselves at every turn; and it is useful, in a more than ordinary degree, to know what "the other fellow" is doing in the way of meeting them. This, it is assumed, was the line of reasoning that led to the calling of a General Meeting of the Wales and Monmouthshire Association of Gas Engineers and Managers, for Thursday, Sept. 26, in the Park Hotel, Cardiff; and the soundness of the decision "to keep on carrying on" was amply justified in the event. No time was lost, and the programme was arranged so that consideration might be given to the problems of to-day; these being discussed in the informal manner which frequently proves most beneficial.

At the outset, the chair was occupied by the outgoing President, Mr. J. PROSSER JONES, of the United Kingdom Gas Corporation, who pointed out that some of the matters which were uppermost in their minds, and which they were wishful to discuss that day, must be regarded as of a confidential nature. Naturally, they had received many apologies for absence, at a time like the present, and one of these he would ask the Secretary to read.

Words of Encouragement

This was a letter from Mr. GEORGE DIXON, of Nottingham, the President of The Institution of Gas Engineers, who said that the notification of the meeting "has reminded me once again of the creditable efforts you are making to carry on under difficult circumstances, and of the very happy time I had with you twelve months ago. You will not be surprised to hear that it is quite impossible for me to attend; but I would be glad if you would convey to your President, President-Elect, and all members my apologies for absence and my best wishes for a successful and happy meeting. We are continuing to experience a type of living in this country to which we are not accustomed; but there is abundant evidence that the Gas Industry is playing its part quietly, but strongly, and when the time comes for the records to be made of our contribution to the war effort, I am sure we will come out with very great credit. In this work your Association is more than playing its part, and it is with considerable pride that I, as President of the Institution for the time being, send you this word of encouragement and an expression of the hope that in the near future we may be all meeting together again under circumstances which will enable us to continue with our work to the credit of all concerned."

New President

The HON. SECRETARY (Mr. E. M. Edwards, of Port Talbot), having submitted the minutes of the last meeting (which were confirmed), announced that there were no new members for election on this occasion.

Mr. PROSSER JONES said it was with extreme pleasure that he asked the new President to take the chair. No one could criticize them for having elected Mr. Aspinall as their President. He came to Wales from Lancashire many years ago, and was now Chief Executive Officer of the gas undertaking owned by the Barry Corporation.

Mr. R. L. ASPINALL (Barry) remarked that the honour the members had done him in electing him as their President was one that he highly appreciated. He would do all he could to help the Association and the national effort. Considering all the circumstances, it was very gratifying to see so many members present. It certainly justified the decision of the Council to hold the meeting. He was especially glad they were to have an opportunity of discussing the question of mutual assistance. In view of what was happening up and down the country, it was their duty to do everything they possibly could in this way. His sincere hope was that, before the end of his year of office, peace would reign once more, and they would again be able to conduct their business in a reasonable manner.

It was now his pleasant duty to thank Mr. Prosser Jones for all he had done on behalf of the Association. As they were aware, he had taken up office at very short notice. Mr. Prosser Jones deserved well of them, and he was delighted to hand him a silver salver, as a slight token of the members' high regard for the services always so freely rendered by him to the Association, and as a memento of his year of office.

Mr. PROSSER JONES, returning thanks, said his one regret was his inability to do more for the Association than he had done. The strenuous times they were passing through had compelled them to cut out their social activities to a large extent, but they had carried on with their work, and they were going to continue to carry on. His year of office would be always a pleasant memory to him.

The next item on the agenda was the presentation to Mr. H. F. Witcombe (Rhondda) of a Higher Grade Certificate in Gas Engineering (Supply), but unfortunately this had not come to hand in time for the meeting.

The PRESIDENT congratulated Mr. Witcombe on his success, remarking that it was a sign of the times that it was on the supply side. It was becoming more and more evident that it was with the relations of the Industry to its consumers that the future greatly lay.

It was now his pleasure to present to Mr. P. Brown the Area Silver Medal for Gas Salesmen, for his paper to the South Wales Circle during the 1939 Session, on "Selling on the District." This, again, was on the supply side. Salesmanship was the key to their business.

He intimated that copies of the annual report and statement of accounts of the Association would be circulated to the members after they had been completed and audited.

Special Purposes Section

Mr. H. D. MADDEN (Cardiff), as Chairman, presented the thirtieth annual report of the Special Purposes Section, the membership of which now consists of 10 local authorities and 26 companies. After dealing with the coke question, the report stated that the Co-Operative Tar Scheme has continued to function satisfactorily throughout the year, but the disappointing prices received for tar products a year or so ago have had a detrimental effect on the prices paid by the scheme to members for crude tar. There are indications, however, that improved results will be shown during the coming year. The question of gas for road transport has received some attention during the year, and information as to filling stations set up for this purpose has been circulated. The Committee are continuing their interest in the educational training of young entrants to the various branches of the Industry, and are arranging prizes, &c., for those successful in examinations as a result of study last session and for interest, &c., in the Junior Gas Association.

The report was adopted, on the proposition of Mr. W. T. KENSHOLE (Merthyr), seconded by Mr. F. BOARDMAN (Cardiff).

Gas Coke Association

Mr. MADDEN said that one question on the agenda was the proposed formation of a Gas Coke Association. It was desired that every district should have its own Coke Association. The hard coke producers had got a 100% Association, while the Gas Industry had about 80% of the total undertakings in different Associations which were affiliated with the central body in London. What was aimed at was something additional to their own Special Purposes Section. It was a matter which called for serious consideration.

Mr. KENSHOLE pointed out that a Committee had been appointed to go into this matter, and had had it under their consideration. The question was found, however, to be an involved one, and they had not yet been able to complete the work they had set themselves to do.

Mr. MADDEN remarked that it was with the question of principle only that they were concerned that day. It was the principle that they should be 100% united in any action that might be taken.

The PRESIDENT thought that they should table a resolution that a Gas Coke Association be formed for the Wales and Monmouthshire District.

Mr. J. H. CANNING (Newport) said he believed that the 20% outstanding was comprised chiefly of small undertakings, and he wondered whether the subscription involved might not be a serious consideration to them.

The PRESIDENT pointed out that the subscription would be only a small one in any case.

Mr. W. CLARK JACKSON (Neath) remarked that they could form a Coke Association, and it could be controlled by the Special Purposes Section; but they did want to get the thing

started. He proposed that such an Association be formed as a separate body under the control of the Special Purposes Section.

Mr. R. J. AUCKLAND (Cardiff) asked whether it would not be better for the new Association to take over the whole coke question. If they treated the matter quite separately, they would have a far better chance of getting a 100% membership than if they confused one body with another.

Mr. JACKSON felt rather inclined to agree that if they could get an Association to operate completely on its own, it would be better.

It was then proposed, and agreed, that a Gas Coke Association be formed.

The PRESIDENT remarked that, now they had got so far, the question of whether the new Association should be managed by the Special Purposes Section or be quite separate could be left to the Committee already in existence in connection with the matter. Thereafter members could be circularized.

Mr. J. STEPHENSON (Aberdare) suggested that the Committee already dealing with the subject might be enlarged beyond the three members now included. Mr. Jackson and Mr. Madden had the whole thing at their fingers' ends, and he proposed that they be added to the Committee.

Mr. CANNING seconded this, and it was agreed to.

Thereafter it was decided that Sir Charles Bird and Mr. Jackson should continue to act as the representatives of the Association on the B.R.T.A. The President remarked that they had the confidence of all the members.

Repairs, Renewals and Maintenance

The PRESIDENT said that a discussion of war-time problems affecting the Gas Industry was the main reason for the holding of the meeting that day amidst the prevailing difficult circumstances.

There were a number of items on the agenda, some of them of a more or less confidential nature.

Mr. R. G. SHADBOLT (Birmingham) said, if he might be permitted as a visitor, he would like to offer a few remarks upon the subject of repairs, renewals, and maintenance of plant and apparatus, which was one of those included on the agenda, because this was a problem which had been brought home forcibly to them during and after the last war. It was also a matter with which Mr. Madden had dealt in the paper on "The Gas Industry in Peacetime and War" which he presented at the meeting of the Association last May. The point which he (Mr. Shadbolt) would like more particularly to make in this regard was with respect to the policy to be adopted with reference to wartime repairs, renewals, and maintenance. In all these questions there were various views that could be taken, but they might dismiss them all with the exception of the long view and the short view. In the case of the war itself, if either the long view or the short view were adopted alone, it would probably lead to disaster, and so, he thought, with regard to their Industry and the major questions of policy, of which he claimed this to be one.

In the paper to which he had already referred, Mr. Madden alluded to this particular phase of war difficulties in these words: "Owing to the scarcity of materials and labour due to urgent Government and military requirements, renewals had perforce to be postponed and neglected, and at the end of the war most undertakings were faced with a list of deferred renewals and urgent extension requirements that were appalling." Then he went on to recite the various achievements of the Industry, and concluded that portion in these words: "The foregoing can only be a general *résumé*, tracing the great advances made by the Gas Industry since the last war, but it is surely a guide and a beacon to the problems we may be called upon to face in the future; and with that accomplished experience we should surely face the future with a strengthened knowledge and resolution." The point could not have been more tersely put.

They were a technical body, and a question like this referred first and foremost to the responsible Technical Chiefs. It was for them to determine upon the policy in regard to this matter; and the duty they owed to country, community, and undertaking, placed in juxtaposition, compelled them to make the best of two worlds, as it were. In an Industry wherein everything used was of a perishable or wearing-out nature, he was a happy man who found himself equipped with everything in "apple-pie order" and condition. Such a one might be tempted to take the short view, and let things slide awhile in the repairs, renewals, and maintenance departments, but even he would find that the longer these were left the more difficult would they be to overtake, as well as becoming more expensive with the passage of time. But he who found himself less fortunate in this respect should certainly not put off until to-morrow whatever could possibly be done to-day, or he would surely reap the crop of which Mr. Madden had spoken. Undoubtedly, it would appear that the Technical Chief held an extremely responsible position, and upon his views and recommendations would depend the future, as well as the present, utility of the undertaking.

The Technical Chief was hedged about with a multitude of conditions and considerations of an abnormal nature, within the ambit of which he was necessarily confined in his operations; but it was imperative that, in every case, according to his individual environment, he must, as the technical custodian, form views and evolve policies such as would best secure the eventual, as well as the present, service of his undertaking to the community. To do this, he dare not do other than keep the best possible pace with all repairs, renewals, and maintenance of plant and apparatus that lay within his power. Arrears in this connexion that were allowed to accumulate would prove a double burden in the future, develop inefficiency in the interim, and cripple the recuperative stage, to the detriment of all interests involved. That the Technical Chief's task was no light one, he (Mr. Shadbolt) was well aware, and the administrators of his undertaking might not always be amenable to his views and policies; but it was up to him—and this was the point that he wished to emphasize—to make his views and policies known to, and understood by, his Board or Committee, or he might find himself, as had happened in the past, saddled with the blame for whatever untoward developments might occur. One was aware of numerous abnormal cases due to vagaries of the war, but, whether normal or the reverse, the initiative lay with the Technical Chiefs to formulate the policy to be pursued, and the sooner they did so the better, if the utility and reputation of the Industry were to be properly conserved.

The Contractors' Side

Mr. W. MORLAND FOX (Messrs. W. J. Jenkins & Co., Ltd.) said he would like, in a few words, to give the contractors' side of this question of repairs, maintenance, and plant renewals, based on the experience of his own Company. Realizing at the outbreak of war the certainty of shortage of materials and the resultant restrictions upon supply, they obtained a Symbol number which covered the supply of any spares to clients who were users of plant manufactured by them, and this enabled them to obtain without difficulty supplies of raw materials quickly and easily to meet calls for spares. This position was, he believed, common to all reputable contracting firms in the Industry. Thus gas undertakings and the Control were relieved of the tedious necessity for multiplication of requests for such licences.

With regard to plant extensions, they found that, where a well-reasoned and well-substantiated case was put forward to the Board of Trade, no difficulty had been experienced in obtaining a licence, and the procuring of material had thereafter depended on the energy of the contractor. As far as emergency and extraordinary plant requirements were concerned, again, if a sound case was made out, a licence could always be readily obtained, and close co-operation between the undertaking and the contracting firm in their approach to the Board of Trade invariably led to quick results.

He would therefore add to the previous speaker's remarks, and ask members not to be apprehensive or to defer their repairs and renewals, but to remember the example of the last war, when the available resources of all contractors were unable to meet the essential requirements of the Industry in the succeeding years of reconstruction.

Difficulties of Smaller Undertakings

Mr. JACKSON said he was glad that this question of repairs, renewals, and maintenance had been raised, because some gas undertakings were having a very trying time. They were being compelled to put down large stocks of coal, which involved heavy outlay. In addition, the smaller undertakings for many years had had other difficulties forced upon them by circumstances, and when they were called upon to spend money in one direction the tendency was to cut down in others—which, as Mr. Shadbolt had shown, was suicidal. Each one should take steps to keep pace with the need for general repairs, and see that any small extensions necessary were proceeded with. An expression of opinion such as Mr. Shadbolt had given, following up Mr. Madden's paper, to which reference had been made, would be very useful to place before Boards of Directors. The war would not last for ever, and they as an Industry looked forward to many years of prosperity after it had ended. He felt convinced that it was up to the Association to endeavour to thresh out a mutual assistance scheme,

whereby small undertakings could get technical advice and help in keeping their works up to as high a standard of efficiency as possible.

Mr. STEPHENSON remarked that prices might be higher still after the war.

Mr. JACKSON suggested that the Council might be asked to look into this matter and form a Sub-Committee of engineering members pure and simple with a view to seeing what could be done. If they were going to have the small works in good condition after the war, they had got to have a mutual assistance scheme operating.

A.R.P. Hints

The HON. SECRETARY having given details of what was being done in the direction of forming district groups for mutual assistance in A.R.P. matters,

Mr. FOX said he would like to put forward a few suggestions in connexion with A.R.P. work, based on experience, for the possible benefit of members. With regard to water supplies for fires, it should be remembered that the normal supply, whether from external sources or internal pumping, was liable to be ineffective owing to shut-offs or bomb damage, and alternative supplies in the form of streams, ponds, or gasholder tanks should be prepared, with suction lines easily accessible. When incendiary bombs of the "thermite" type fell in coal and coke heaps, they should tackle the coke heap first. Coal smothered the bomb through lack of air, but in a coke heap more trouble was always experienced. Fires caused either by incendiary or explosive bombs dropping on or near gasholders were frequently aggravated or carried to other holders or plant by ignition of the filming oil in tanks.

Other matters were discussed up to the limit of available time, and then (it having been decided that the place and date of next meeting should be left to the decision of the Council) a party of about seventy sat down to luncheon in the Park Hotel. Here the Lord Mayor of Cardiff (Alderman Henry Johns, J.P.) joined them, and in the course of a little speech-making congratulated the Association upon their determination to hold such a meeting as they had had that morning under the prevailing circumstances. There seemed, he said, to be a feeling abroad that at a time like the present these conferences should not be held. This was a mistake. During such an emergency the best of every industry should be brought forward in the national interest, and this was a sufficient reason for exchanging views and experiences. The Association had shown sound common sense, and he ventured to assert that the members had reaped that day great benefit from having met. Each one would return to his work better prepared to meet the difficulties of the situation. Among other guests at the luncheon was Alderman T. J. Yorwerth, Mayor of Cowbridge.

PROGRESS UNDER GROUPED CONTROL

Many arguments have been waged from time to time in connexion with the effect upon gas undertakings of central control and grouping. As an outstanding example of the advantages of grouping, the case of the Campden Gas Company may be of interest; and Mr. A. L. Morris gives us the past few years' history of this first small company acquired by the Severn Valley Gas Corporation.

THE Campden Gas Company was purchased by the Severn Valley Gas Corporation in 1934. It was then known as the Campden Gas, Coal, Coke & Lighting Co. (1920), Ltd., and manufactured gas to supply Chipping Campden, a small and picturesque Cotswold town in North Gloucestershire.

Campden was the first small company to be incorporated in the Severn Valley group, and it was felt that progress might be made by placing it under the jurisdiction of the Cheltenham and District Gas Company, which had in recent years extended mains to parishes and villages within a reasonable distance of Chipping Campden. The condition of the Company was rapidly deteriorating, the works dilapidated, mains and services bad, and it was not unusual for the gas supply to fail altogether. The management was retrogressive, and the sale of gas had fallen in 1933 to a little over a million cu.ft. per annum. In these circumstances the project was regarded as experimental, but it was thought that success could be attained as a result of the combined effort of the Severn Valley Gas Corporation and of the Cheltenham Gas Company.

The subscribed capital of the Campden Company amounted to £1,935, consisting of 1,260 £1 preference shares and 675 £1 ordinary shares. No dividend had been paid for four years, and there was a deficiency in the Profit and Loss Account amounting to £70.

In the early part of 1935 a showroom was opened in Campden's main street. The price of gas was reduced from 7s. 6d. to 5s. 2d. per 1,000 cu.ft. A loan from the bank, guaranteed up to £10,000 by the Severn Valley Gas Corporation, was obtained, and general activities commenced.

Every effort was made to improve the local conditions during the period the main was being extended from the Cheltenham district to enable a bulk supply to be taken and while a new 60,000 cu.ft. gasholder was being built. The main and holder were connected up within six months of the work being started.

Venture Justified

With the new administration it was obvious from the commencement that results would justify the venture, and new consumers were obtained with considerable ease. During the latter part of 1934 and up to June, 1935, the number of consumers had increased by over 100%, and the sale of gas for the year amounted to 4¼ million cu.ft.

Since 1935 the mains in Campden have been renewed and also extended to embrace the villages of Broad Campden, Ebrington, and Blockley. The number of consumers, the sale of gas, and the profits have risen as follows:

	Gas Sales.	Profits.	Consumers.
1934	2,237,200 cu.ft.	£83	310
1935	4,797,600 „	£300	462
1936	9,839,100 „	£288	715
1937	12,616,500 „	£691	804
1938	14,609,300 „	£1,402	855
1939	16,789,900 „	£1,820	913

It is anticipated that the sale of gas for the current year will be well over 20 million cu.ft.

The arrears of dividends have been paid up, and last year the capital was increased to £15,000, with an issued capital of £12,000, the whole of which was subscribed by the Severn Valley Gas Corporation. At the same time as the capital was increased the name of the Undertaking was changed to the less ponderous one of the Campden Gas Company, Ltd. The dividend paid in 1939 was at the rate of 12½%.

The Company is under the direction and management of the Cheltenham Company, and the same domestic routine is applied to both Companies. In consequence, the many special services available from the controlling company in connexion with sales, publicity, engineering, &c., are advantageously utilized.

Campden is 24½ miles from Cheltenham, and when the mains were connected a 6-in. high-pressure spun-iron main with Stanton-Wilson joints was laid from the village of Willersey—the nearest point to which the Cheltenham mains extended at that time. The environments referred to are supplied by low-pressure mains, the furthest point being Blockley, a distance of 31 miles from Cheltenham.

Sales and Service

In the early stages of development every possible opportunity was taken to emphasize to the public and potential consumers the many advantages of gas. Canvassers were systematically and freely employed, but little difficulty was experienced in obtaining new consumers immediately the Company was in a position to ensure an adequate supply at good pressure. The display of modern appliances at demonstrations and exhibitions was an education to the residents, many of whom were unaware of the progress made in this direction. The use of the controlling Company's travelling showrooms (both mobile and stationary vehicles) in the streets was another excellent sales promotion medium.

The actual sale of appliances prior to control was dormant, and difficulty was experienced in obtaining cookers, of which the black variety were the only ones available. The following summary of sales for recent years will therefore be of interest:

Number of Appliances Sold

1935	326
1936	349
1937	249
1938	211
1939	199
	1,334

Another interesting feature of progress was the obtaining of the public lighting contract in 1939, after many years of lighting by electricity.

The present staff consists of a Local Manager with one fitter

and mate, which is augmented when necessary from Cheltenham. Transport facilities, purchases, storage of appliances and commodities, &c., are also matters in connexion with which the Cheltenham Company gives consideration when making their own arrangements.

From the foregoing short résumé of routine and management of the Campden Gas Company under the direction of the Cheltenham Company, it will be gathered that the relationship with the controlling Company has been of considerable advantage. The developments referred to are in no way concluded, and it is anticipated this small Company will progress still further.

A good deal of the credit for the energy displayed and success achieved has been due to the local Official in charge, Mr. C. L. Singleton.

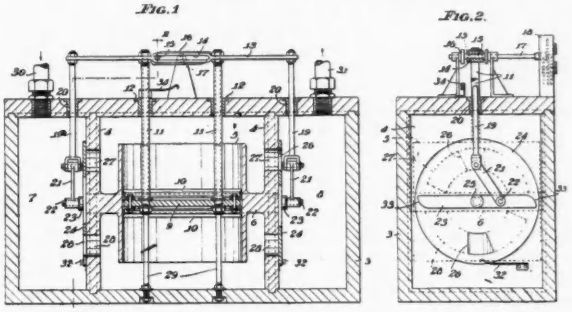
NEW PATENTS

A Non-Corrosive Meter

A non-corrosive meter is the subject of a patent (No. 525,150; application date, Feb. 15, 1939) granted to T. W. Bennett. The object is to provide a meter which is compact in form, simple in construction and therefore capable of cheap manufacture, and which will be efficient in operation.

Fig. 1 is a longitudinal section through the meter, and Fig. 2 is a cross-section on line II—II in Fig. 1.

The meter comprises an outer casing 3 in which is fitted a structure comprising a pair of spaced-apart vertical walls 4, a vertical cylinder 5 and a horizontal plate 6 which supports the cylinder from the walls 4 and which completely closes the space existing between



the cylinder and the walls. Walls 4, cylinder 5, and plate 6 are formed solid with one another, preferably by moulding them from synthetic resin or other mouldable substance. The structure comprising these parts is centrally positioned in the length of the outer casing 3 so as to leave inlet and outlet gas chambers 7 and 8 respectively between the walls 4 and the adjacent ends of the casing. The walls 4 are rabetted into the top and bottom and side walls of the outer casing or are otherwise united thereto in gastight manner.

Within the cylinder 5 there is free to reciprocate a piston 9 which at its periphery is provided with any suitable means for providing a gas-tight joint with the cylinder 5, such as, for instance, cup washers 10 as shown. To the piston are attached the lower ends of tubular rods 11 which pass upwardly through brushes 12 in which they are adapted to slide, the portions of the rods which project above the top of the outer casing 3 being attached to a bar 13. This bar 13 is formed with a flattened loop providing a slot 14 in which is engaged a crank pin 15 provided on a crank arm 16 fixed on a shaft 17 which imparts a drive to the consumption indicator 18.

To the bar 13 are also attached a pair of vertical rods 19 which pass down through and are adapted to slide in bushes 20 in the top of the casing, each of rods 19 having a forked lower end to which is fulcrummed a connecting rod 21, the other end of said connecting rod engaging a crank pin 22 provided on a crank arm 23 which is solid with a valve disc 24. Arm 23 and disc 24 are rotatable about a stud 25 projecting from the adjacent wall 4 of the inner structure.

Each of the valve discs 24 has formed through it an opening 26 which is adapted to register in turn with arcuate ports 27, 28 formed in the adjacent wall 4 of the inner structure, concentric with stud 25, the disc 24 having contact with the outer face of wall 4. The ports 27 lie wholly above the division plate 6 of the inner structure while the ports 28 lie wholly below plate, and the opening 26 in the valve discs are in diametrically opposite relation.

The tubular rods 11 attached to the piston are arranged to slide in telescopic fashion over guide rods 29 which are fixed to and upstand from the bottom of the outer casing. The gas inlet and outlet pipes of the supply are indicated by references 30 and 31 respectively.

In the operation of the meter and assuming that the inlet chamber 7 is communicating with the bottom of cylinder 5 via the opening 26 in the adjacent valve disc and associated port 28, gas will enter the bottom of the cylinder via the disc opening and port and in consequence the piston 9 will rise under the influence of the gas pressure. Such rising of the piston will result in the body of gas already contained in the upper part of the cylinder being expelled from the latter with consequent delivery of gas into and through the outlet chamber 8 by way of the opening 26 in the adjacent disc, and the associated passage 27. The rising of the piston will result in corresponding rising of the assembly comprising the rods 11, bars 13, and rods 19 and consequent turning of the discs 24 through their crank arms 23 connected to said rods 19. When the cranks reach their uppermost positions, the openings 26 in the inlet and outlet discs 24 are no longer in register with the ports 28 and 27 respectively, the opening in the inlet-control disc being about to open the associated port 27 on continued rotation of the disc, while the opening in the outlet-control disc is about to open the associated port 28. When the ports are thus opened, gas will pass from the inlet chamber 7 into the upper end of cylinder 5 and the descending piston 9 will expel the body of gas from beneath the piston into the outlet chamber 8. The energy derived from the pressure of the gas is now further utilized during the resultant downward movement of the assembly 11, 13, 19, and cranks 23 to continue the rotation of the control discs 24.

To obviate any possibility of the cranks 22 coming to rest at a dead-centre position there is provided in conjunction with each of them a spring finger 32 adapted to be depressed by an approaching end of the crank arm 23 just before the dead-centre position is reached. In the dead-centre position the finger bears on a cam-shaped trailing edge 33 of the crank arm 23 and the co-operation of the finger and cam face is such as to give the crank 22 an impulse beyond the dead-centre position. A similar device for the same purpose is provided for the index-operating crank arm 16, reference 34 indicating the spring finger for co-acting therewith.

Gas Governors

Among the new patents is one granted to the Bryan Donkin Company, Ltd., and E. E. Doe (No. 524,896; application date, Feb. 10, 1939). It relates to gas governors of the pressure or volumetric type.

The governors are usually fitted with diaphragms, but pistons or bells may be used instead, and where the word "diaphragm" is used in the specification it is intended to cover the words "piston" or "bell."

Two forms of construction are illustrated in sectional elevation in the accompanying diagrams.

Referring first to Fig. 1, *a* is the inlet portion of a gas main and *b* is the outlet.

If there is only a small demand for gas the flow is as follows: Into the inlet *a*, upwardly through a pipe *c* into an inspirator *d*,

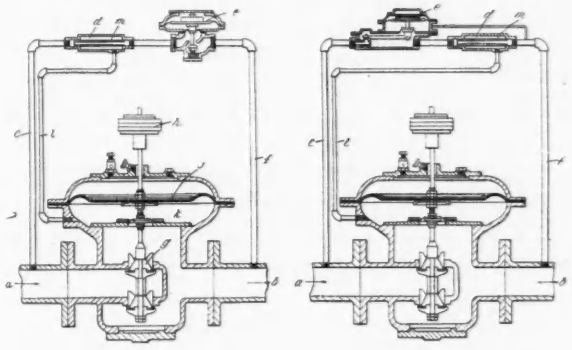


Fig. 1 Fig. 2

then into a pilot governor *e*, and downwardly through a pipe *f* to the outlet *b*. The main governor *g* remains closed during this flow owing to the fact that the load *h* on the diaphragm *j* balances the pressure in the chamber *k* beneath the diaphragm.

Should the gas supply demand be greater, the increased flow through the inspirator *d* will cause a depression of pressure in the chamber *m* which will allow gas to flow from the chamber *k* through the pipe *l* into the chamber *m* and through the ports in the inspirator throat into the stream flowing from the pipe *c* through the inspirator *d*, governor *e* and through the pipe *f* into the outlet branch *b*. This flow from the chamber *k* will allow the weight *h* to displace the diaphragm *j* with consequent opening of the main governor.

The arrangement shown in Fig. 2 is similar to that of Fig. 1, except for the fact that in Fig. 2 the gas passes through the pilot governor before passing through the inspirator, the outlet pressure in this case keeping the main governor closed, whereas in the case of Fig. 1 the inlet pressure does this.

Although the device has been described in connexion with a variation of pressure beneath the diaphragm of the main governor the pressure variation may be applied to the upper side of this governor.

CONVERSION OF PETROL VEHICLES TO TOWN GAS

Issued to the Technical Press through the Institute of Fuel

By

E. A. C. CHAMBERLAIN, Ph.D., D.I.C.

WHEN a simple conversion of a petrol vehicle is undertaken it is understood that minimum alterations will be made to the engine, and that either petrol or gas may be used at will. The primary consideration of such a conversion is that the cost of the alterations shall be as low as possible consistent with reasonable performance on the alternative fuel, and that the performance on petrol shall not be adversely affected by any of the alterations made. Secondly, it is important that any driver should be able to change from one fuel to another easily and rapidly.

These restrictions operate against optimum performance on gas, and possible improvements in engine performance have to be rejected in view of high cost of alteration or resulting difficulties when running on petrol. However, the last year has shown that the simple conversion can be most successful, and that the limitations imposed do not seriously affect the value of gas as an alternative fuel. The low-pressure system can, therefore, make a valuable contribution to the national economy of petrol. In presenting this Paper an attempt has been made to discuss some of the theoretical and practical problems which have arisen and to indicate what developments have taken place during the past year.

Power Output

The power development of a particular engine is entirely dependent on the properties of the fuel supplied to it, and will vary with different fuels. It has been found that town gas gives a smaller power output than petrol, and it has been thought advisable to review the theoretical considerations involved in order to check the experimental results obtained on the test bed. The chief considerations are:

1. The net calorific value of the fuel air mixture.
2. The specific volume change on combustion.
3. The specific heats of the products of combustion and the degree of dissociation at high temperatures.
4. The latent heat of evaporation of the fuel if liquid.
5. The specific gravity of the fuel/air mixture.
6. The radiation from the flame and hot products.

The two fuels between which comparison has been made are No. 3 petrol as specified in Technical Data on Fuel(1) and town gas of the following analysis:

CO_2—2.5, O_2—0.6, C_3H_6—2.6, CO—10.8, CH_4—21.1, C_2H_6—0.7, H_2—54.4, N_2—7.0.

500 B.Th.U. cu.ft. gross, 456 B.Th.U. net.

When running on gas the fuel/air ratio for optimum power is about 1:4.1 by volume, so that the fuel/air mixture entering the cylinder on each induction stroke consists of 80% air and 20% fuel. On petrol the fuel enters in the form of a heavy vapour occupying under 2% of the total volume inspirated. There is, therefore, in effect a loss in volumetric efficiency when operating on gas.

The following figures are taken as a basis of comparison between the two fuels:

	No. 3 Petrol.	Town Gas.
Calorific value of theoretical fuel air mixture (air 60%RH., 60° F.)	95.0 B.Th.U./ cu. ft.	85.2 B.Th.U./ cu. ft.
Specific volume change on combustion, i.e., volume of products net at S.T.P. volume of mixture at S.T.P.	1.062	0.915
Mean specific heat of products of combustion, 0–2,200° C.	0.02385 B.Th.U./ cu. ft.	0.0244 B.Th.U./ cu. ft.
Latent heat of evaporation	254 B.Th.U. lb.	—
Specific gravity of the fuel air mixture ...	1.04	0.89

It is not possible to estimate singly the effect of these factors, since they are all interdependent, but it is possible to indicate their general significance.

The difference in calorific value of the fuel/air mixtures is 10.3%, and this is the most important of the factors tending to reduce the power output on gas, but it must be considered in conjunction with factors 2 and 3. The specific volume change indicates an expansion of 6.2% on petrol and a contraction of 8.5% with gas so that the ratio of volumes after combustion is

$$V \text{ gas}/V \text{ petrol} = 0.861.$$

This factor obviously reacts in favour of petrol, since it tends to give a bigger pressure development in the cylinder with a lower working temperature. However, the higher specific heat of the products of combustion of town gas tend to reduce the flame temperatures. The combined effect of these three factors may be considered as follows: The theoretical flame temperature (ignoring dissociation) is—

petrol, 2,080° C., 2,353° A.; gas, 2,120° C., 2,393° A.

The effect of this difference on the pressure development is of the order of 1.5% in favour of gas. Considered in conjunction with the V gas/V petrol ratio, 0.861, the ratio of pressures developed at constant volume under these ideal conditions will be:

$$0.861 \times 1.015 = 0.875;$$

so that the pressure development on gas is less by 12.5%.

It is interesting to note the effect of rich mixtures on the specific volume change which occurs with both gas and petrol. Taking, for example, town gas:

—	Theoretical mixture for complete combustion.		
Air gas ratio	4.3 : 1	4 : 1	3.5 : 1
Specific volume change	0.915	0.956	0.974
Potential heat in flue products ...	Nil	8.6%	22.4%

This increase is due to the larger number of molecules owing to the existence of some carbon monoxide and hydrogen in place of carbon dioxide and water vapour. The actual power developed will, of course, depend on the balance between the increase in the specific volume change and the decrease due to the loss of heat developed. The figures given indicate that the maximum power mixture will be about 4.1 : 1. Burstall,(2) working on a single-cylinder engine, found that maximum power was obtained with a 20% rich coal gas air mixture—*i.e.*, an air gas ratio of 3.82 : 1—but this result was obtained by adjusting ignition timing valve setting, &c., to give the optimum power and not under simple conversion conditions. We have found in experiments on a Commer 14/4 and an Austin 16/6 that the maximum power is obtained with the mixture giving an exhaust analysis of 10% CO_2 and 1.4% CO on gas of the composition previously given. This corresponds to an air gas ratio of 4.14 : 1, a result very close to that obtained theoretically.

The latent heat of evaporation of the fuel has a considerable effect on the volumetric efficiency of the engine, since with petrol the air fuel charge is cooled by about 28° C.(3) If the temperature of the charge drawn into the cylinder is taken as 380° A,(4) the result of this cooling effect is to increase the volumetric efficiency by about 7%. On gas this intrinsic cooling effect is absent, and the working temperature of the cylinder will also be higher; so it may be anticipated that the warming of the entering charge by convection on the cylinder walls will be greater with gas than with petrol and that the temperature difference will be increased.

The differences in viscosity and specific gravity of the air fuel mixture will become important as far as these factors influence the discharge characteristics of the two mixtures through the valve gear. It is not possible to calculate for a general case the value of this effect, but the equivalent effect on any engine will be inversely proportional to the square roots of the densities of the two mixtures. Here the advantage lies with town gas, since

$$\sqrt{\text{petrol}/\text{gas}} = \sqrt{1.04/0.89} = 1.08.$$

Cooling Losses from the Burning Charge

It is necessary at this point to consider what differences exist in the energy dissipation with gas and with petrol. Few data are available on the conduction from hot gases to the cylinder walls under the conditions of turbulence that exist in an engine cylinder. At low temperatures (100° C. to 500° C.) the rate of cooling is proportional to the temperature difference between the hot gases and the walls of the cylinder. The percentage loss by conduction will, therefore, vary as the surface volume ratio of the cylinder, and will therefore be lower as the diameter of the cylinder increases—an important factor when comparison is made between the large-bore gas engine and the relatively small-bore multi-cylinder high-speed petrol engine converted to gas. At elevated temperatures, however, the simple temperature difference relationship is not valid. According to David(5) the rate of cooling increases rapidly at higher temperatures, being proportional to the second power of the temperature difference at 1,500° C. and to as much as the fifth power at 2,400° C. It will be realized, therefore, that though the calculated flame temperatures of gas and petrol differ by only 40° C., the effect on the conduction losses may well be more significant.

The radiation losses may be considered as arising primarily from the carbon dioxide and water vapour contents of the explosion products (Schack).(6) As pointed out by Bone and Townend,(7) it might be supposed that as gases under suitable conditions are capable of absorbing the radiations which they emit, they would therefore be opaque to such radiations; but it must be remembered that the molecules are relatively far apart, and hence a large percentage of the radiations escapes. Callendar(8) arrived at the conclusion that the emission from a gas layer 5 cm. thick at 20 atmos. would be within ½% of that from an infinite depth.

It is possible, therefore, to calculate approximately the radiation for the two air fuel mixtures being considered. The simplified formula recently proposed for estimating these losses is:

$$Q\,CO_2 = 3.5\,\sqrt[3]{PS}\,(T/100)^{7\cdot5}$$
$$Q\,H_2O = 35.\,P^{\,8}\,S^{\,6}\,(T/100)^{3}$$

where Q = radiation in K cal/m² hr.
P = partial pressure in atmospheres.
S = depth of radiating layer in meters.
T = temperature °A.

Radiation from other gases present can be ignored.

The exhaust gas analysis (wet) at theoretical fuel/air ratio for petrol and town gas is as follows :

—	Petrol.	Town gas.
CO_2	12.9	9.9
H_2O	13.3	20.4
N_2	73.8	69.7

The difference is appreciable, and in practice it will be still further emphasized by the CO and H_2 present in the products from petrol which will reduce the CO_2 and H_2O percentages. As an example, the radiation from the two exhaust gases has been calculated for a pressure of 20 atmospheres at 2,500° C. with a radiating layer 6 cms. deep.

Petrol $QCO_2 = 268{,}000$ K cal/m² hr.
$QH_2O = 533{,}000$ „ „
$QCO_2 + QH_2O = 801{,}000$ „ „
Gas $QCO_2 = 245{,}600$ „ „
$QH_2O = 753{,}000$ „ „
$QCO_2 + QH_2O = 998{,}600$ „ „

Under these conditions—*i.e.*, identical flame temperatures—there is with gas 23.6% more radiation from the products of combustion. It should be remembered that this computation ignores radiation from incandescent carbon particles in the flame.

It has not been possible to obtain any figures of direct conduction and radiation losses from an engine operating on gas or petrol, but the following determination of jacket losses shows that there is a greater heat loss to the walls when operating on gas than on petrol.

GAS.

R.P.M.	B.H.P.	Gas rate cu. ft./hr.	Heat input B.Th.U./hr.	Temp. rise in cooling water ° F.	Heat content of cooling water B.Th.U./hr.	Jacket loss %	Power development % heat input.
1,000	13.6	372	185,500	71	80,250	43.2	18.7
1,500	19.6	530	264,000	86	100,000	37.9	18.9

PETROL.

R.P.M.	B.H.P.	Petrol consumption gall./hr.	Heat input B.Th.U./hr.	Temp. rise in cooling water ° F.	Heat content of cooling water B.Th.U./hr.	Jacket loss %	Power development % heat input.
1,000	13.6	1.3	195,000	66.5	72,500	37.2	17.8
1,500	19.6	1.8	270,000	86.0	93,800	34.5	18.5

Loss of Potential Heat in Exhaust Gases

The optimum power setting on a petrol engine requires a rich fuel/air mixture, and as a result an appreciable part of the exhaust loss is made up of potential energy of unburned gases. A typical analysis on petrol would be :([9] [10])

CO_2	10%	H_2	2.8
O_2	1%	CH_4	0.25
CO	5%	N_2	80.95

This potential heat corresponds to about 17% of the gross calorific value of the fuel. The optimum power setting on gas is also on the rich side of the neutral mixture, but in a simple conversion it is found that enrichment beyond 105% of the correct mixture fails to increase the power developed. It follows that on petrol the waste heat includes up to 6.9% of the gross C.V. as latent heat plus 10 to 12% as potential heat, while on gas up to 10% is present as latent heat and the potential heat in unburned products is small. If two engines are running on petrol and town gas at equal thermal efficiencies the amount of sensible heat is, therefore, greater on gas than on petrol.

Summing up the foregoing considerations, it is possible to express the percentage power loss on simple conversion of a petrol engine to gas in the form—

Loss % = 100 (1 − f × volumetric efficiency ratio × F) where f = a factor involving calorific value of the fuel air mixtures, specific heat of the products of combustion and specific volume change. In other words :

f = the ratio of pressures developed by explosion of equal volumes of the two fuel/air mixtures at constant volume.

F = an indeterminate factor involving flame characteristics, convection, and radiation losses, greater than unity.

Power loss = 100 (1 − 0.875 × 0.93 × F).
= 100 (1 − 0.814 F).

It is therefore to be expected that under the conditions of simple conversion the power loss will not be less than

100 (1 − 0.814)%.

Power loss = 18.6% of the power on petrol.

Experimental Determinations of Power

Burstall([11]) gives a comparison of petrol and gas on a single cylinder test engine (Cambridge E.35) at 1,500 r.p.m. at a compression ratio of 5 :1. I.M.E.P. on petrol 141, on gas 126 lb. per sq.in., corresponding to a power loss of 10.7%. This figure must be regarded as ideal, since the engine was specially tuned to obtain maximum power on both fuels.

Walter([12]) quotes the following results for the simple conversion of a 7-h.p. 4-cylinder engine:

—	Max. B.H.P.	Fuel consumption per B.H.P./hr.	Brake thermal efficiency %.
On petrol	11.2	—	22.6
On gas	7.4	27 cu. ft.	19.6

Loss of power on gas 34%.

The same Author([13]) states that on engines with the C.R. increase to 6.5 : 1 it is possible to obtain with town gas 85% of the power on petrol, and 90% if the hot spot in the induction system is removed.

Rixman([14]) did complete tests with gas and petrol on two engines—(1) a slow-running 6-cylinder engine of 120 mm. bore × 160 mm. stroke, normal speed 1,250 r.p.m. ; (2) a high-speed 6-cylinder engine, 79.4 mm. bore and 117.5 mm. stroke, maximum speed 3,200 r.p.m. Engine No. 2 had marked preheating of the induction system. His results are given as follows :

ENGINE 1.

Speed.	Loss of power %.
700	20
900	21.5
1,100	19.5
1,300	14
1,500	9.5

ENGINE 2.

Speed.	Loss of power %.
1,200	21
1,600	19
2,000	22
2,400	24
2,800	25

Our own test results may be summarized as follows :

Engine.	R.P.M.	Gas.	Petrol.	% power loss on gas.
Commer 14·4 ...	2,500	20.1	30.0	33.0
Austin 16·6	2,500	30.2	39.4	23.4
M.G. Sports	4,500	30.2	42.0	28.0

These results were obtained on unmodified engines.

As would be expected, these results indicate that the loss of power on typical small high-speed engines is greater than on the larger cylinder type of slow-running engine. It is therefore possible to anticipate that the power losses on vehicles converted to town gas will be :

(1) Lorries with slow-running engines, 15 to 20%.
(2) Light vans and private cars, 20 to 30%.

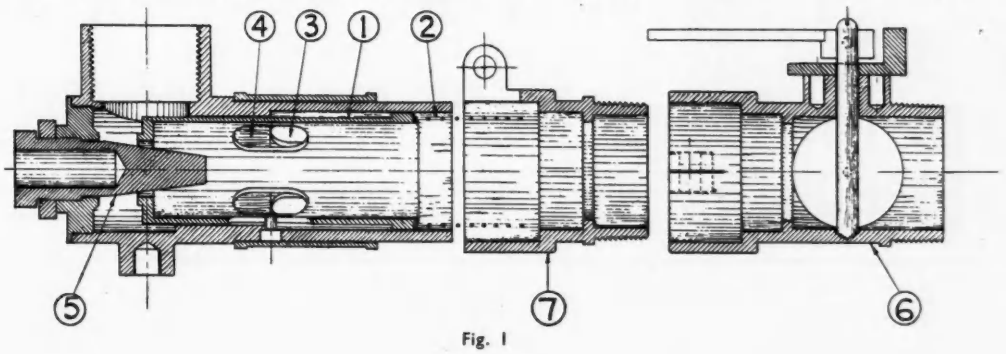


Fig. 1

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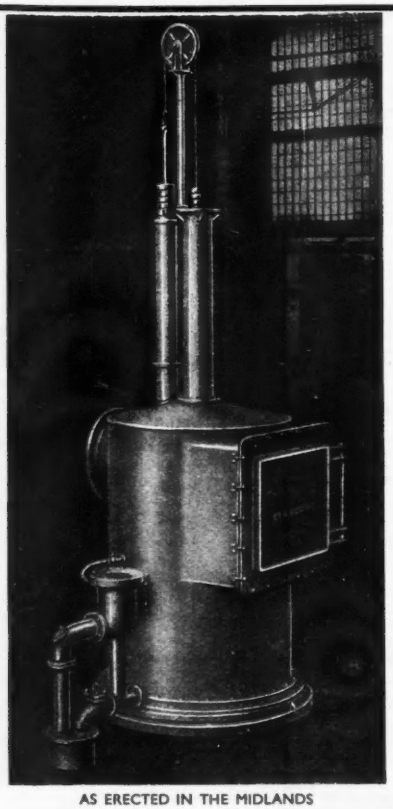

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Thermal Efficiency of the Engine

Heat that is not converted into work is left to raise the temperature of the cooling water and of the exhaust gas, so that the higher the efficiency, the lower the waste heat must be. This effect is bigger than is at first evident; for consider two engines, one giving 18% efficiency, and the other 25%. At the same heat input the waste heats are in the ratio of 82/75 = 1.1. If, however, a comparison is made on the basis of equal b.h.p. output, the waste heat raio is

$$82/75 \times 25/18 = 1.52.$$

So that the less efficient engine when working at the same power output has 52% more waste heat to dissipate.

The conversion of a petrol engine does not necessarily reduce the thermal efficiency; indeed, under the right conditions slightly higher efficiencies than with petrol can be obtained[15]. With simple conversions these conditions are not attained. As a result it appears that the efficiencies of gas conversions are often slightly lower than on petrol. Dynamometer tests show that between 25 to 30 cu.ft. per b.h.p. may be expected for a normal conversion. Typical results obtained are as follows:

14/4 Commer. Carburetter G.L.C. No. 1.

R.P.M.	Cu. ft./B.H.P./hr.	Efficiency %.
1,500	30.8	16.6
2,000	27.4	18.6
2,500	29.0	17.6
3,000	28.6	17.9

16/6 Austin. Carburetter G.L.C. No. 2.

R.P.M.	Cu. ft./B.H.P./hr.	Efficiency %.
1,500	27.4	18.6
2,000	28.0	18.2
2,250	25.0	20.4
2,500	27.6	18.5

C. M. Walter and J. S. Clarke[16] do not give actual efficiency figures in this form except for an engine with the compression ratio increased to 5.6 : 1; but from curves[17] drawn for the engine (Austin 20/6) in its original form with a compression ratio

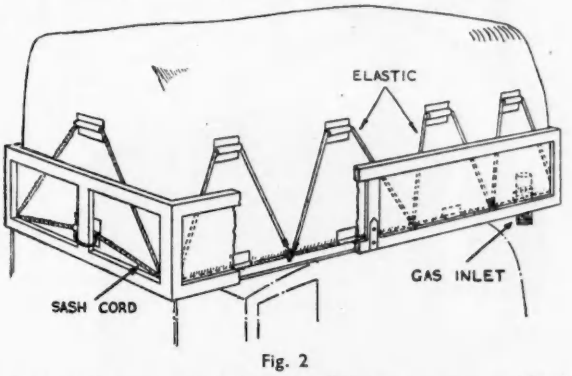

Fig. 2

of 4.6 : 1 it appears that the best efficiency on gas was 20.5%, equivalent to 24.8 cu.ft./b.h.p./hr. with a calorific value of 500 B.Th.U./cu.ft.

For the modern petrol engine the corresponding consumption may be taken as 0.6 pint/b.h.p./hr.[18] which corresponds to an efficiency of 22.6%. While these figures may be taken as an average on grade 1 petrol, our own results on the Austin 16/6 running on Pool petrol indicate a consumption of 0.65 to 0.7 pint per b.h.p./hr., giving efficiencies between 20.9% and 19.4%.

Influence of Ignition Timing

It has been found on road tests with vehicles fitted with manual ignition control (Ford 24.9-h.p. van and a Morris Commercial 14-h.p. van) that the optimum ignition setting on gas was only slightly in advance of that for petrol, whereas it is generally considered that a large ignition advance is desirable. A test on the Austin 16/6 gave the following results:

R.P.M.	B.H.P.	Cu. ft./B.H.P.	Ignition timing.
1,500	19.5	26.35	1° after T.D.C.
1,500	19.5	26.75	6° before T.D.C.
1,500	19.15	27.25	11° " "
1,500	18.35	29.40	16° " "
1,500	17.78	31.2	21° " "
1,500	16.72	34.7	26° " "
1,500	14.68	38.3	36° " "
1,500	12.50	44.8	46° " "

Following this test, attempts were made to recover part of the power loss at the advanced ignition settings by readjusting the air gas ratio delivered by the carburetter, but no significant improvement could be obtained.

It appears, therefore, that though it is possible on gas[19] to obtain higher thermal efficiencies by working with weak mixtures and a large ignition advance, this result can only be obtained at the expense of power output which cannot be afforded in the general conversion.

Sparking Plugs

Owing to the fact that an engine tends to run hotter on gas than on petrol, it is sometimes found that when converted to gas pre-ignition occurs, due to plugs overheating. This is by no means general, and usually any trouble can be cured by setting plug gaps to 15/1,000 in. and advancing the ignition slightly. Small engines up to 12 h.p. on certain makes of vehicle are sometimes difficult to cure by this means, and plugs with a higher heat dissipation factor are required. The following list gives an indication of the plugs recommended:

Maker.	14 mm.	
	Standard.	Gas.
K.L.G.	F 50	F 70 X.
Lodge	C 14	H.D. 14 H.B. 14 (Sintox).
Champion ...	L 10	L 10 S, LA 10

This list covers ½-in. reach plugs only, and makers' lists should be consulted for more complete information of other plugs.

Gas Carburetter

It is, perhaps, unfortunate that the name carburetter should have persisted, since it is not an apparatus for adding carbon to the gas. However, the word has been universally accepted for its petrol counterpart, and the phrase "air gas proportioner" is too clumsy for general use, and "mixer" has been found to cause some confusion when dealing with the motor trade. The minimum requirements of a gas carburetter are:

1. To give a constant air gas ratio over the whole range of operation.
2. To cut off the gas when the engine is stationary.
3. To give immediate response to throttle variations.
4. To provide easy starting, steady idling, and freedom from stalling on disengaging the clutch or after braking.
5. To have a low intrinsic resistance to gas flow in order to permit as large a volume of explosive mixture as possible to be drawn into the engine.

All these requirements must be fulfilled; and while they may not offer a serious problem if the design of the carburetter is considered in conjunction with a particular engine, the problem is complicated by the necessity of producing a carburetter that can be fitted to engines of widely different design and horse-power. For this reason it is essential that the gas carburetter should be capable of adjustment over a wide range of air gas ratios.

Several suitable carburetters are available which fulfil these conditions, and, as an example, Fig. 1 illustrates the G.L.C. No. 2 carburetter, suitable for use on engines developing up to 60 b.h.p. Its method of operation is as follows:

The suction of the engine moves the piston (1) against the spring (2); air then enters through the adjustable air ports (3) and the corresponding slots (4) in the piston. Gas enters through the annular space between the cone (5) and the piston. The fuel air mixture passes to the engine via the butterfly control (6) or the petrol carburetter adaptor (7).

The fuel air ratio is determined by the angle of the cone: the larger the angle, the richer the mixture. A trimming adjustment for the air-gas mixture is provided by the air shutter. The cone has a short parallel section to enable the mixture to be adjusted for slow-running conditions. Withdrawing the cone enriches the mixture at low engine speeds only, and this adjustment should not be used to increase the gas supply under load conditions, as correct air gas ratio will not then be maintained. It should be remembered that with gas there is no condensation of the fuel in the induction system when starting a cold engine, and that there is therefore no need for a choke or other means for obtaining a temporarily rich mixture.

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19. D. R. Pye: *Loc. cit.*, p. 184.

(*To be Continued*).

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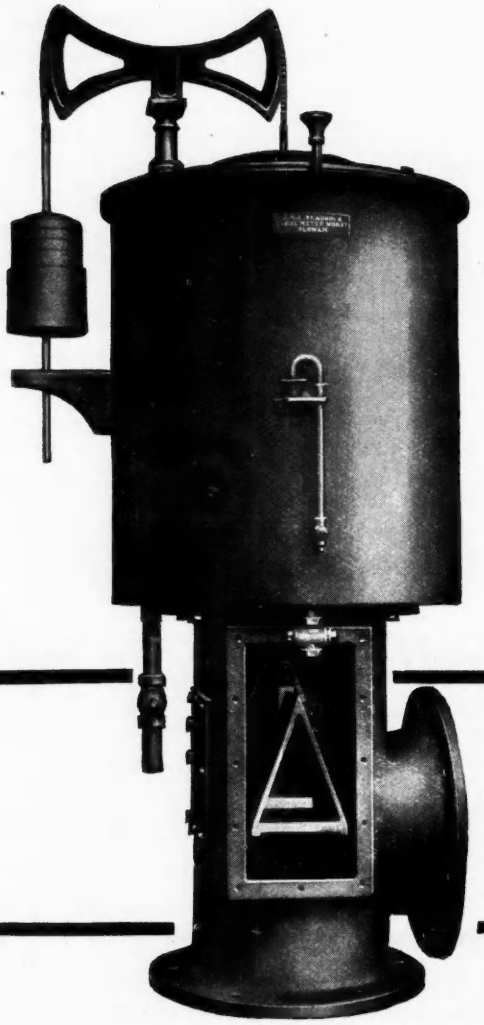

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Gas Products Prices

The London Market

Oct. 7

Prices of Tar Products in the London market remain unchanged, values being today as follows: Pitch remains nominal, creosote is about 4⅜d. to 5d. per gallon, refined tar 3⅜d. to 4d., the price of pure toluole under the Ministry of Supply Toluene No. 2 Order is 2s. 5d. per gallon, pure benzole 1s. 10d., 95/160 solvent naphtha 1s. 11d. to 2s. 0d., and 90/160 pyridine about 17s. 6d. all per gallon naked, refined naphthalene crystals £23 per ton in bags, all *ex* Makers' Works.

The Provinces

Oct. 7

The average prices of gas-works products during the week were: Pitch and Crude Tar.* Toluole, naked, North, 1s. 9½d. (Controlled by the Ministry of Supply Order No. 1, which fixes the maximum price at which this material may be sold). Coal tar, crude naphtha, in bulk, North 9d. to 9½d. Solvent naphtha, naked, North, 1s. 8d. to 1s. 9d. Heavy naphtha, North, 1s. 4½d. to 1s. 5½d. Creosote, *ex* works, in bulk, North liquid and salty, 4½d. to 4¾d.; Scotland, 4½d. to 4¾d.; low gravity, 4½d. to 4¾d. Fuel Grade, 4d. to 4¼d. Carbolic acid, 60's, 3s. 6d. to 3s. 7½d. Naphthalene, £15 to £20. Salts, 75s. to 85s., bags included. Anthracene, "A" quality, 4½d. to 4¾d. per minimum 40% purely nominal. Heavy oil: Unfiltered anthracene oil, (min. gr. 1,080), 5¼d. to 5½d.; filtered heavy oil (min. gr. 1,080), 5¾d. to 6d.; heavy anthracene oil gr. less than 1,080, 6d. to 6½d.

* In regard to pitch and crude tar prices we would ask readers to refer to the editorial note in our issue of Sept. 4, p. 404.

Scotland

GLASGOW, Oct. 5.

No change of any consequence can be reported as having taken place during the week. Most products are available in sufficient quantity with prices unchanged.

Crude gas-works tar.—Value is nominal at 42s. 6d. to 45s. per ton *ex* Works in bulk.

Pitch of vertical quality is offered at 35s. to 40s. per ton f.o.b. for export and about 35s. per ton *ex* Works in bulk for home trade.

Refined tar.—There is less activity in the home market with controlled prices unchanged at 4¼d. to 4½d. per gallon. For export supplies can be secured at 3½d. per gallon, both f.o.r. naked.

Creosote oil.—There is a better demand for all qualities, but meantime quotations remain unchanged as follows: Specification oil, 5d. to 5¼d. per gallon; low gravity, 6d. to 6¼d. per gallon; neutral oil, 5¾d. to 6d. per gallon; all *ex* Works in bulk.

Cresylic acid remains weak with supplies available as under: Pale, 99/100%, 2s. 2d. to 2s. 4d. per gallon; Pale, 97/99%, 1s. 11d. to 2s. per gallon; Dark, 97/99%, 1s. 7d. to 1s. 9d. per gallon; all *ex* Works in buyers' packages.

Crude naphtha is changing hands as available at 6½d. to 7½d. per gallon *ex* Works in bulk, according to quality.

Solvent naphtha.—90/160 grade is 1s. 8½d. to 1s. 9d. per gallon and 90/190 heavy naphtha is 1s. 4½d. to 1s. 5½d. per gallon.

Motor benzole is 1s. 9d. to 1s. 9½d. per gallon.

Pyridine.—90/160 grade is 17s. to 18s. per gallon and 90/140 grade is 19s. to 20s. per gallon.

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GAS STOCKS AND SHARES

The chief feature of Stock Exchange affairs last week was the large increase in the volume of business in industrial shares and the consequent upward movement in prices. This has been largely attributable to the extension of inter-office telephonic communication now available during air raid warnings. Despite this increased activity in industrial shares, the interest in gilt-edged stocks has not abated and although there were slight fluctuations during the week the quotations of British Government Stocks finally closed at the same levels as a week ago. There was not much call for oil, rubber, and tea shares, while some profit-taking in the Kaffir market eased up the recent advances in this section.

In contrast to the previous week, there was little business done in the Gas Market and with very few exceptions quotations closed without change. In the Official List Southampton dropped back 4 points to 60½, Croydon sliding scale eased 2 points, and Severn Valley £1 shares closed 6d. lower at 14s. There was no changes of importance at the Provincial Exchange or in the Supplementary List.

The Directors' report of the Colonial Gas Association, Ltd. (of Melbourne), for the year ended June 30, 1940, shows that after the payment of the loan and debenture interest and providing for income taxes and depreciation, the net profit for the year is £89,435 (against £85,590). After adding £25,454 brought in and deducting the interim dividend payment there remains £75,962 available. The final ordinary dividend is maintained at 3% (again making 6% for the year) and £5,500 (against £7,500) has been placed to reserves. It is satisfactory to note that the sales of gas increased by 14.2% against 4.84% the previous year. Sanction is being sought at the annual general meeting to increase the capital of the company by the creation of 100,000 8% preference shares of £1 each.

Quotations on the London and Provincial Stock Exchanges

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Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations Oct. 4.	Rise or Fall on Week
1,767,439	Sept. 16	7	7	Alliance & Dublin Ord. ...	102—112	...
374,000	July 1	4	4	Do. 4 p.c. Deb. ...	90—95	...
957,608	May 13	5	5	Assocd. Gas & Water U'd'ts Ord.	12/—14/	...
500,000	"	4½	4½	Do. 4½ p.c. Red. Cum. Pref.	15/6—17/6	...
535,545	"	4	4	Do. 4 p.c. Red. Cum. Pref.	14/6—16/6	...
336,646	"	4	4	Do. 4 p.c. Irred. Cum. Pref.	12/—14/-	...
561,370	Aug. 12	7	7	Barnet Ord. 7 p.c.	100—105	...
300,000	Apl. 8	1/4½	1/9⅜	Bombay, Ltd.	19/6—21/6	...
690,407	Aug 19	7	7	Bournemouth 7 p.c. max. ...	100—110	...
362,025	June 17	4	4	Do. 4 p.c. Deb. ...	75—85	...
659,955	Aug. 19	6½	4⅜	Brighton, &c., 5 p.c. Con. ...	68—73	...
855,000	Sept. 30	8	6	Brit. Gas Light Ord.	75—85*	...
545,000	June 17	5½	5½	Do. 5½ p.c. 'B' Cum. Pref.	110—115	...
120,000	"	4	4	Do. 4 p.c. Red. Deb.	75—80	...
10,000	Nov. 6, '33	6	4	Cape Town, Ltd., 4½ p.c. Cu. Pf.	¼—¾	...
626,860	July 15	5⅞	6	Cardiff Con. Ord.	89—94	...
24,500	Sept. 23	7	7	Colombo Ord. 7 p.c. Pref ...	19/—21/-*	...
764,169	Mar. 26	-/11.48	-/11.48	Colonial Gas Assn. Ltd. Ord. ...	14/6—16/6	...
400,000	"	1/3.30	1/3.30	Do. 8 p.c. Pref. ...	20/—22/-	...
1,748,935	July 22	2	3	Commercial Ord.	37—42	...
620,000	June 10	3	3	Do. 3 p.c. Deb.	58—63	...
286,344	Aug. 19	5	5	Do. 5 p.c. Deb.	88—93	...
807,560	Aug. 12	7	6	Croydon sliding scale	85—90	−2
644,590	"	5	5	Do. max. div. ...	90—85	...
620,385	July 1	5	5	Do. 5 p.c. Perp. Deb. ...	90—95	...
179,500	Aug. 19	5⅜	5	East Surrey 'B,' 5 p.c.	75—80	...
176,461	June 17	5	5	Do. 5 p.c. Deb. (Irred.) ...	90—95	...
250,000	July 8	4	6	Gas Consolidation Ord. 'B' ...	13/6—14/6	...
250,000	May 13	4	4	Do. 4 p.c. Red. Cum. Pref.	15-/—17/-	...
19,152410	July 29	3⅜	4½	Gas Light & Coke Ord. ...	13/—15/-a	...
2,600,000	"	3½	3½	Do. 3½ p.c. max.	54—59	...
4,477,106	"	4	4	Do. 4 p.c. Con. Pref. ...	72—77	...
2,993,000	July 8	3½	3½	Do. 3½ p.c. Red. Pref. ...	80—85	...
8,602,497	June 3	3	3	Do. 3 p.c. Con. Deb. ...	65—70	...
3,642,770	"	5	5	Do. 5 p.c. Red. Deb. ...	99—104	...
3,500,000	"	4½	4½	Do. 4½ p.c. Red. Deb. ...	98—103	...
700,000	Sept. 9	3½	3½	Do. 3½ Red. Deb. ...	80—85	...
5,600,000	May 13	4	8	Imperial Continental Cap. ...	37—42	...
43,820	July 29	3½	3½	Do. 3½ p.c. Red. Deb. ...	63—68	...
231,978	Aug. 19	5	5	M.S. Utility 'C' Cons. ...	68—73	...
918,657	"	4	4	4 p.c. Cons. Pref.	72—77	...
675,000	May 6	†4	†4	Montevideo, Ltd.	52—57	...
300,000	Apl. 29	9	7	Oriental, Ltd.	100—110	...
368,537	June 3	7	8	Plymouth & Stonehouse 5 p.c.	90—100	...
621,667	Aug. 19	8⅛	7½	Portsmouth & Gosport Cons.	97—102	...
648,999	Sept. 16	1/1	1/1½	Severn Val. Gas Cor. Ld. Ord.	13/—15/-	−/6
597,972	"	-/10⅜	-/10⅝	Do. 4½ p.c. Cum. Pref. ...	15/6—17/6	...
2,528,714	Sept. 2	1/-	-/7½	South East'n Gas Cn. Ld. Ord.	9/—11/-	...
1,000,000	"	-/10⅜	-/10⅝	Do. 4½ p.c. Red. Cum. Pref.	14/—16/-	...
1,068,869	"	4	4	Do. 4 p.c. Irred. Cum. Pref.	13/—15/-	...
6,709,895	Aug. 5	4	4	South Met. Ord.	53—58	...
1,135,812	"	6	6	Do. 6 p.c. Irred. Pref. ...	98—108	...
850,000	"	4	4	Do. 4 p.c. Irred. Pref. ...	70—75	...
1,895,445	July 1	3	3	Do. 3 p.c. Perp. Deb. ...	60—65	...
1,000,000	July 15	5	5	Do. 5 p.c. Red. Deb. ...	95—100	...
1,543,795	July 22	3	4	South Suburban Ord. 5 p.c. ...	60—70	...
512,825	July 8	5	5	Do. 5 p.c. Perp. Pref. ...	88—93	...
500,000	"	4	4	Do. 4 p.c. Perp. Pref. ...	71—76	...
250,000	"	3⅜	3⅜	Do. 3⅜ p.c. Red. Pref. ...	80—85	...
888,587	June 10	5	5	Do. 5 p.c. Perp. Deb. ...	90—95	...
750,541	Aug 9	5½	5	Southampton Ord.	56—63	−4
350,000	Feb. 12	5½	5½	Swansea 5½ p.c. Red. Pref. ...	90—95	...
1,076,495	Aug. 5	5	5	Tottenham & District Ord. ...	68—78	...
338,555	"	5	5	Do. 5 p.c. Pref.	93—98	...
453,380	June 10	4	4	Do. 4 p.c. Perp. Deb. ...	78—83	...
1,247,505	May 20	4	6	U. Kingdom Gas Cor. Ord. ...	12/—14/-	...
1,085,952	May 13	4½	4½	Do. 4½ p.c. 1st Cum. Pref. ...	13/6—15/6	...
772,709	"	4	4	Do. 4 p.c. 1st Red. Cum. Pref.	13/—15/-	...
745,263	June 17	4½	4½	Do. 4½ p.c. 2nd Non-Cum. Pf.	12/6—14/6	...
1,200,000	Sept. 9	3½	3½	Do. 3½ p.c. Red. Deb. ...	82—87	...
380,606	Aug. 5	7	6⅝	Uxbridge, &c., 5 p.c.	80—90	...
1,371,138	July 8	3½	4	Wandsworth Consolidated ...	62—72	...
2,525,768	"	4	4	Do. 4 p.c. Pref.	60—70	...
1,343,964	June 17	5	5	Do. 5 p.c. Deb.	90—95	...
383,745	"	4	4	Do. 4 p.c. Deb.	80—85	...
558,342	July 15	6	5	Watford & St. Albans Ord. ...	88—93	...
300,000	June 10	3½	3½	Do. 3½ p.c. Red. Deb. ...	85—90	...

SUPPLEMENTARY LIST

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations Oct. 4.	Rise or Fall on Week.
351,685	June 17	5	5	Brighton, &c., 5 p.c. Perp. Deb.	90—95	...
28,700	" 17	5½	5½	Do. 5½ p.c. Red. Deb. 1942 ...	96—101	...
415,250	" 17	4	4	Bristol Gas Co., 4 p.c. New Deb.	85—90	...
140,205	July 29	7	7	Cambridge, &c., 7 p.c. Cons. 'B'	100—110	...
295,932	Aug. 19	5	5	Cheltenham, 5 p.c. Cons. Ord....	88—93	...
42,500	July 1	4	4	Do. 4 p.c. Perp. Deb....	82—87	...
150,000	Aug. 12	4	4	Croydon Gas, 4 p.c. Pref. (Irr.)	70—75	...
130,000	July 1	4	4	Do. 4 p.c. Deb. ...	75—80	...
146,700	Aug. 19	5½	5½	East Surrey, 5½ p.c. Pref. 'A' ...	95—100	...
53,220	" 19	6	6	Do. 6 p.c. Cum. Pref. ...	100—110	...
117,425	Feb. 5	8	8	East Wight, 5 p.c. Cons. Ord. ...	100—110	...
	Aug. 19	6	4	Eastbourne, 'B' 3½ p.c. ...	65—75	...
239,135	July 8	5	5	Gas Consolidation 'A' Ord. (£1)	13/6—15/6	...
156,600	Aug. 19	5	5	Hampton C't, 5 p.c. Cons. Ord.	68—73	...
18,000	June 10	7	7	Malta & Med'n., 7 p.c. 1st Pref.	60—65	...
10,845	" 10	7½	7½	Do. 7½ p.c. 2nd Pref.	60—65	...
50,000	Aug. 19	£5 19 6	£5 4 6	Mid. South. Util., 'A' Cons. 5 p.c.	63—73	...
65,000	Aug. 12	5	5	North Middlesex, 5 p.c. Pref....	85—90	...
70,000	Sept. 9	5	5	Plymouth & Stone., 5 p.c. Deb.	87—92	...
76,501	July 1	4	4	Reading, 4 p.c. Perp. Deb. ...	75—80	...
74,777	Sept. 30	4	4	Romford, 4 p.c. Debs. (Reg.) ...	77—82*	−8
21,000	June 10	5	5	Slough, 5 p.c. Perp. Deb. ...	90—95	...
211,740	" 17	5	5	Southampton, 5 p.c. Red. Deb.	96—101	...
363,575	July 1	5	5	Tottenham, 5 p.c. Reg. Red. Mt.	95—100	...
202,019	Mch. 18	7½	6⅝	Tunbridge Wells, 4 p.c. Scale ...	70—80	...
135,257	June 10	5	5	Uxbridge &c., 5 p.c. Perp. Deb.	90—95	...

PROVINCIAL EXCHANGES

47,756	July 26	6	5	Bath Cons.	98—103	...
122,577	July 22	7	6	Blyth 5 p.c. Ord.	100—105	...
1,667,250	July 15	5	5	Bristol, 5 p.c. max.	86—89	...
120,420	June 17	4	4	Do. 1st 4 p.c. Deb.	94—96	...
415,250	"	4	4	Do. 2nd 4 p.c. Deb. ...	92—95	...
328,790	"	5	5	Do. 5 p.c. Deb.	108—111	...
157,150	Aug. 5	6½	5	Chester 5 p.c. Ord.	98—101	...
92,500	June 17	4	4	Do. 4 p.c. Pref.	80—85	...
36,430	"	3½	3½	Do. 3½ p.c. Deb.	80—85	...
41,890	"	4	4	Do. 4 p.c. Red. Deb. ...	94—98	...
542,270	Aug. 12	9	6	Derby Cons.	100—105	...
55,000	June 10	4	4	Do. 4 p.c. Deb.	96—102	...
10,000	Aug. 19	10	10	Great Grimsby 'A' Ord. ...	170—180	...
6,500	"	10	10	Do. 'B' Ord. ...	170—180	...
79,000	"	10	10	Do. 'C' Ord. ...	160—170	...
732,000	Aug. 26	4	4	Hartlepool G. & W. Cn. & New	63—68	...
2,167,410	Aug. 19	6	6	Liverpool 5 p.c. Ord.	96—98	...
245,500	June 17	5	5	Do. 5 p.c. Red. Pref. ...	97½—100½	...
306,083	July 15	4	4	Do. 4 p.c. Deb.	99—101	...
20,000	June 24	5	5	Long Eaton 5 p.c. Pref.	9—11	...
80,000	June 24	5	5	Do. 5 p.c. Deb.	100—105	...
2,430,267	July 29	5⅞	5	Newcastle and Gateshead Con.	16/—17/-a	...
682,856	"	4	4	Do. 4 p.c. Pref.	74—76	...
776,706	Dec. 27	3½	3½	Do. 3½ p.c. Deb.	80—85	...
277,285	April 24	5	5	Do. 5 p.c. Deb. '43 ...	97—102	...
274,000	July 26	5	5	Newport (Mon.) Ord.	89—93	...
13,200	Sept. 16	8½	7	Pontyp'l Gas & W. 10 p.c. 'A'	11¼—12½	...
13,600	"	6	5	Do. 7 p.c. 'B'	9¼—10½	...
40,000	"	5	6	Do. 7 p.c. 'C'	9¼—10½	...
106,280	Aug. 5	8	10	Preston 'A' 10 p.c.	157—167	...
188,219	"	7	7	Do. 'B' 7 p.c.	113—123	...
1,806,339	Aug. 26	6½	6½	Sheffield Cons.	117½—123½	...
95,000	July 8	4	4	Do. 4 p.c. Deb.	97— 99	...
332,351	Feb. 5	6	6	Sunderland 6 p.c. max. ...	107—112	...
140,778	Aug. 12	5	5	Weston-super-Mare Cons. ...	80—85	...
64,338	June 24	4	4	Do. 4 p.c. Deb.	75—85	...
33,340	"	7½	7½	Do. 7½ p.c. Deb.	137—145	...

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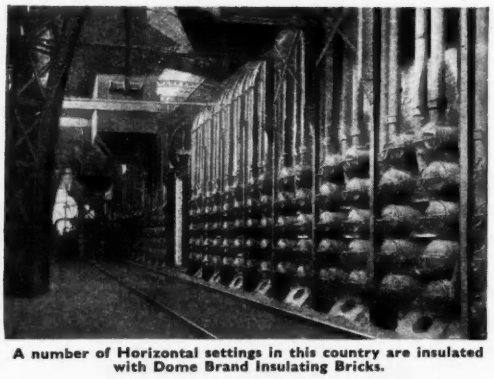

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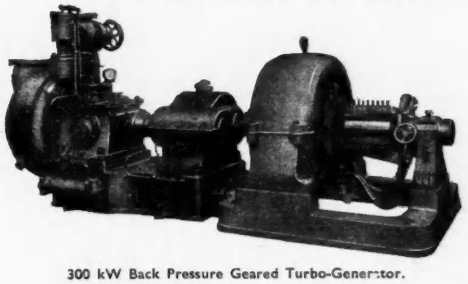

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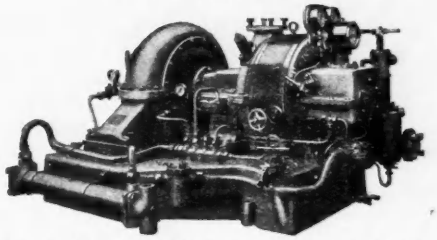

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